# Aerosol Light Absorption and Scattering at Four Sites in and Near Mexico City: Comparison with Las Vegas, Nevada, USA

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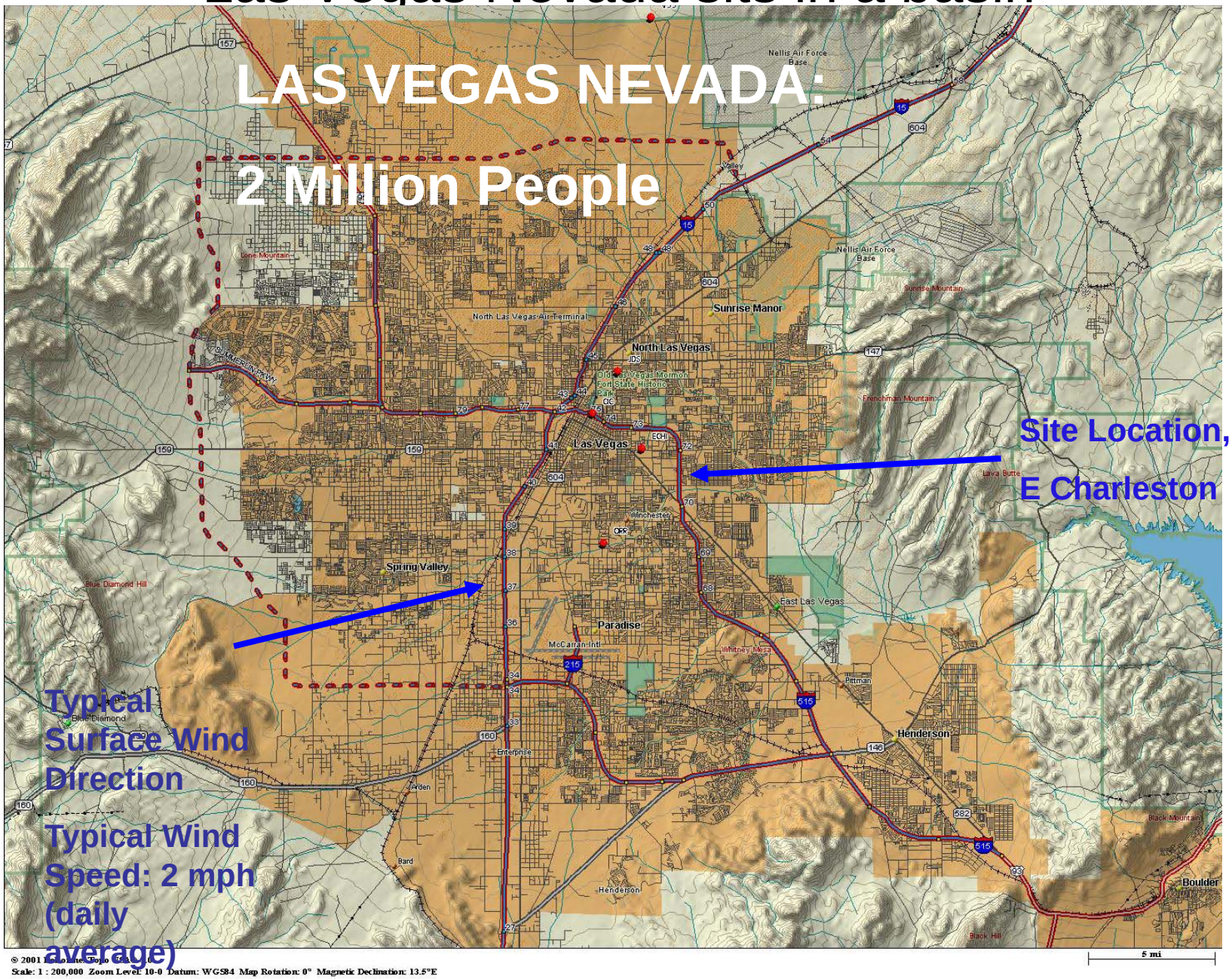
Scale 25 miles between
IMP and U of Tecamac
Scale 65 miles between IMP and La Biznaga
Pachuca
Ranch Bisnaga (T2)
Tecamac (T1)
Tlalnepantla
IMP (T0)
Mexico City, Mexico
(Mexico City)
Ciudad de Mexico
Distrito Federal
Tlaxcala
Tlaxcala
MEXICO CITY:
23 Million People
Paseo de Cortes (T3)
Puebla
Puebla
Cuernavaca

# Las Vegas Nevada sits in a basin

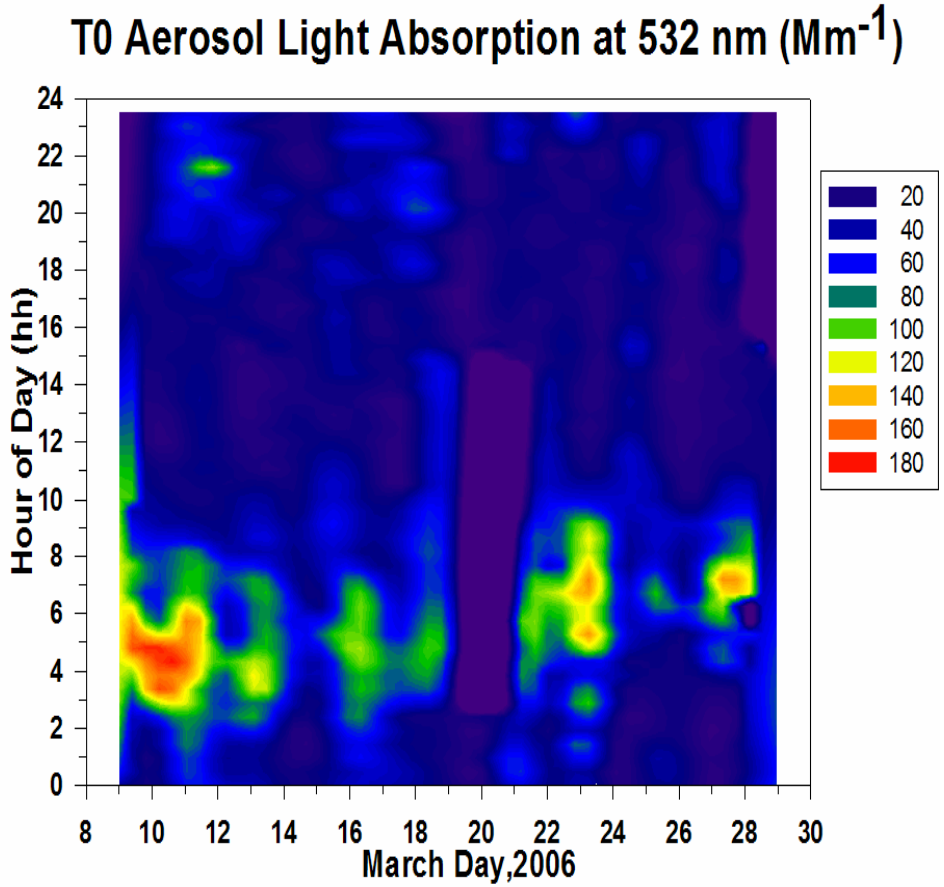


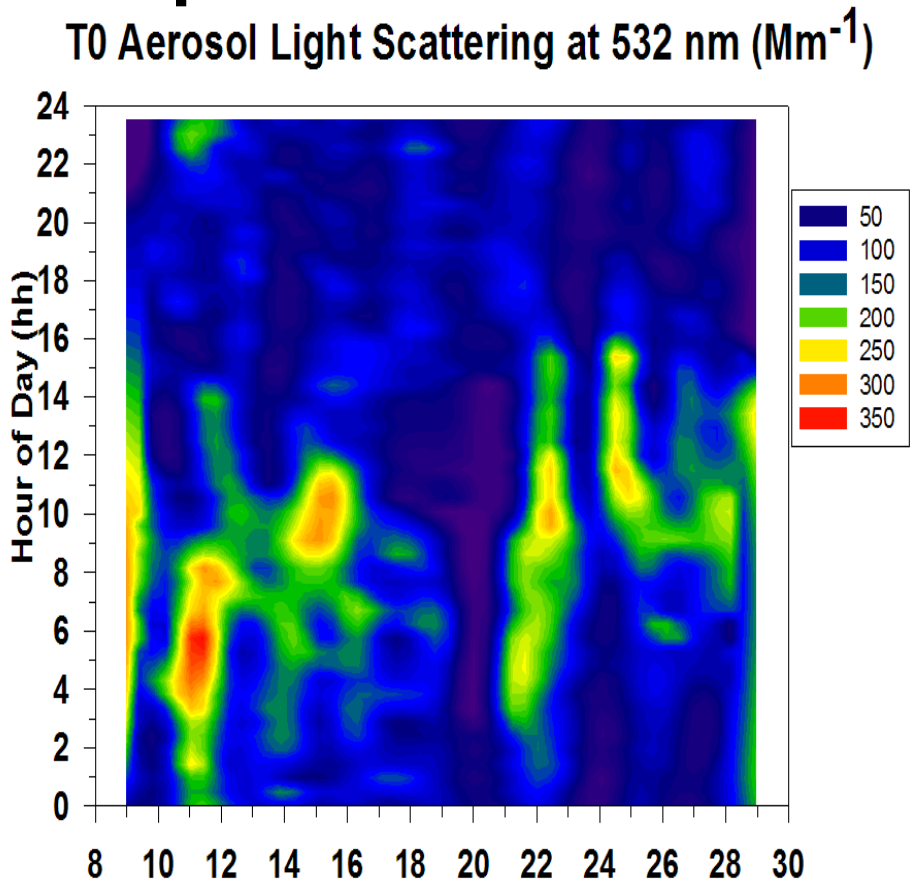
# Pollution Scaling with City Population

**Peak Air Pollution scales as the Square Root of Population**

$$\frac{\text{MEXICO CITY}}{\text{LAS VEGAS}} = 3$$

# TO Site Mexico City, Aerosol Optics for 532 nm



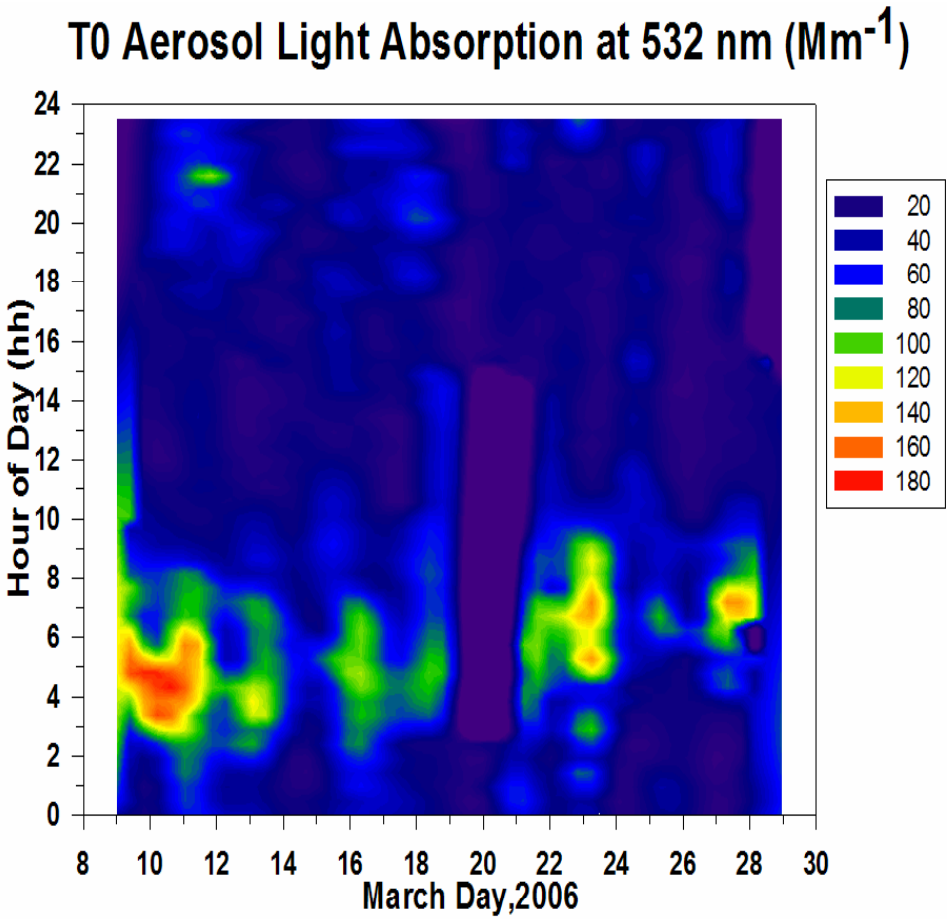




**Mostly Soot** **All Particles**

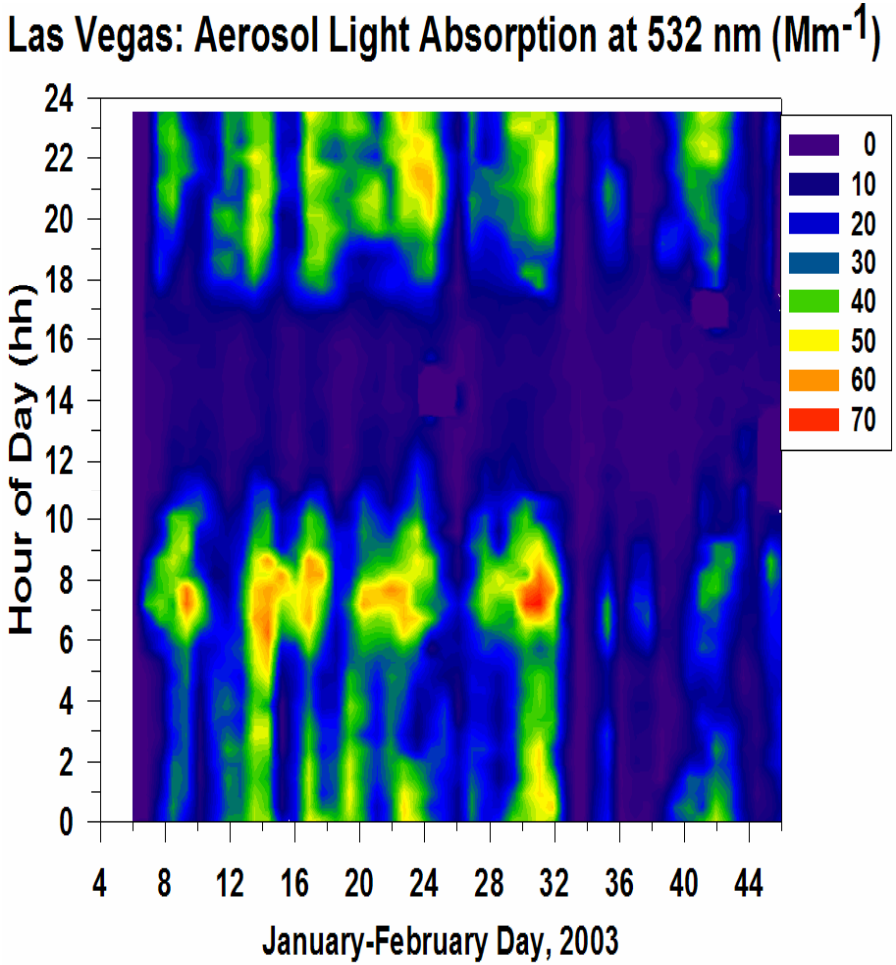
***Aerosol Absorption:*** *Note the day to day variability in the peak absorption, probably due to meteorology.*

***Aerosol Scattering:*** *Aerosol Scattering peaks later in the day than absorption, probably due to dust, OC, and inorganics.*

# Mexico City & Las Vegas NV Light Absorption (soot)




MEXICO CITY

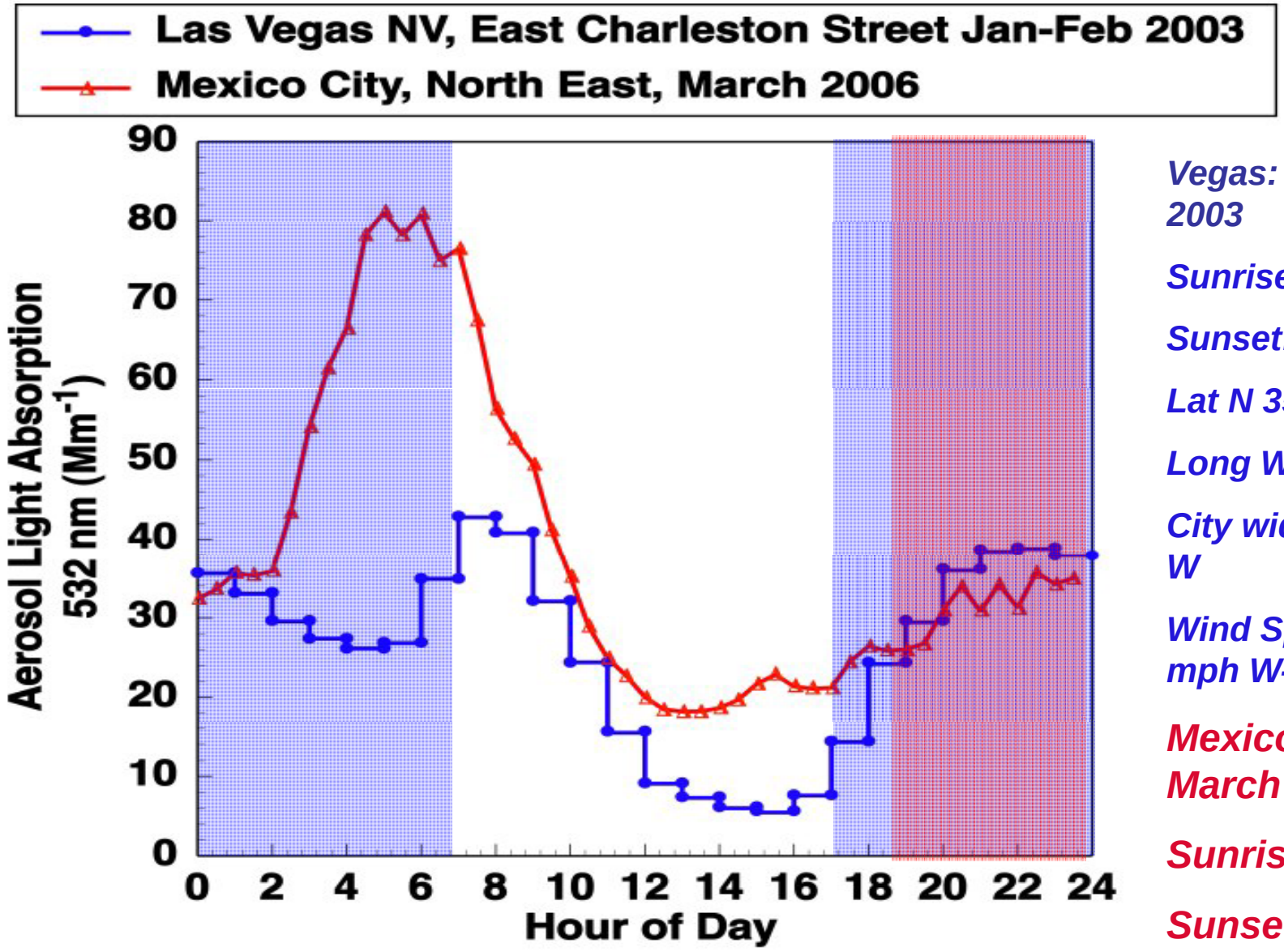



LAS VEGAS NV

***Mexico City peak value is larger by about a factor of 3.***

**Mexico City has greater day to day variation, and greater absorption in the morning hours.**

# Diurnal Aerosol Light Absorption




*Vegas: February 1, 2003*

*Sunrise: 6:42 am*

*Sunset: 5:07 pm*

*Lat N 35.2*

*Long W 115.2*

*City width 11 miles E-W*

*Wind Speed Ave 2.4 mph W-SW*

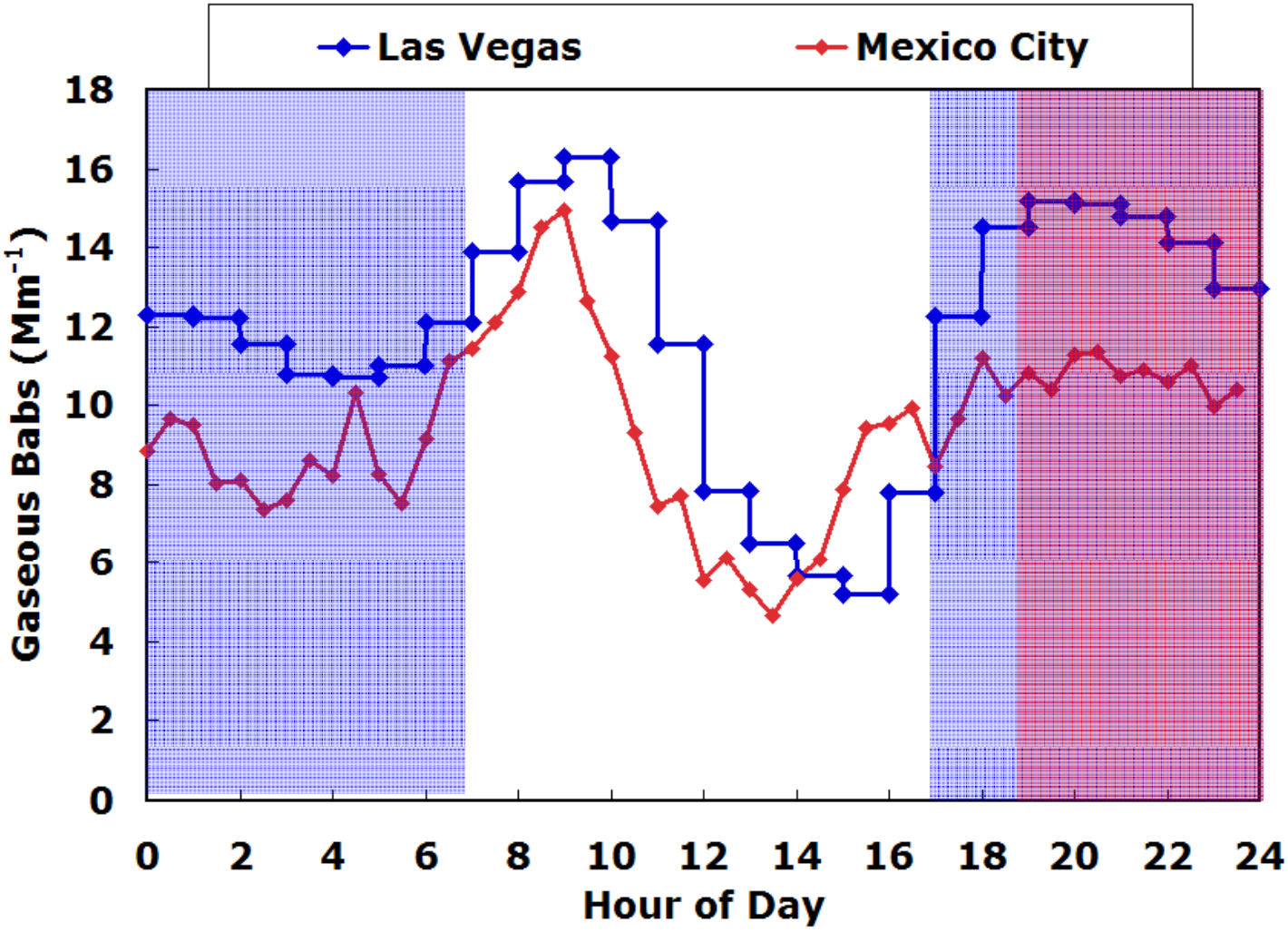
*Mexico City: March 15, 2006*

*Sunrise: 6:45 am*

*Sunset: 6:45 pm*

*Lat N 19.49*

# Gaseous Light Absorption ($NO_2$) at 532 nm




***Vegas: February 1, 2003***

***Sunrise: 6:42 am***

***Sunset: 5:07 pm***

***Lat N 35.2***

***Long W 115.2***

***City width 11 miles E-W***

***Wind Speed Ave 2.4 mph W-SW***

***Mexico City: March 15, 2006***

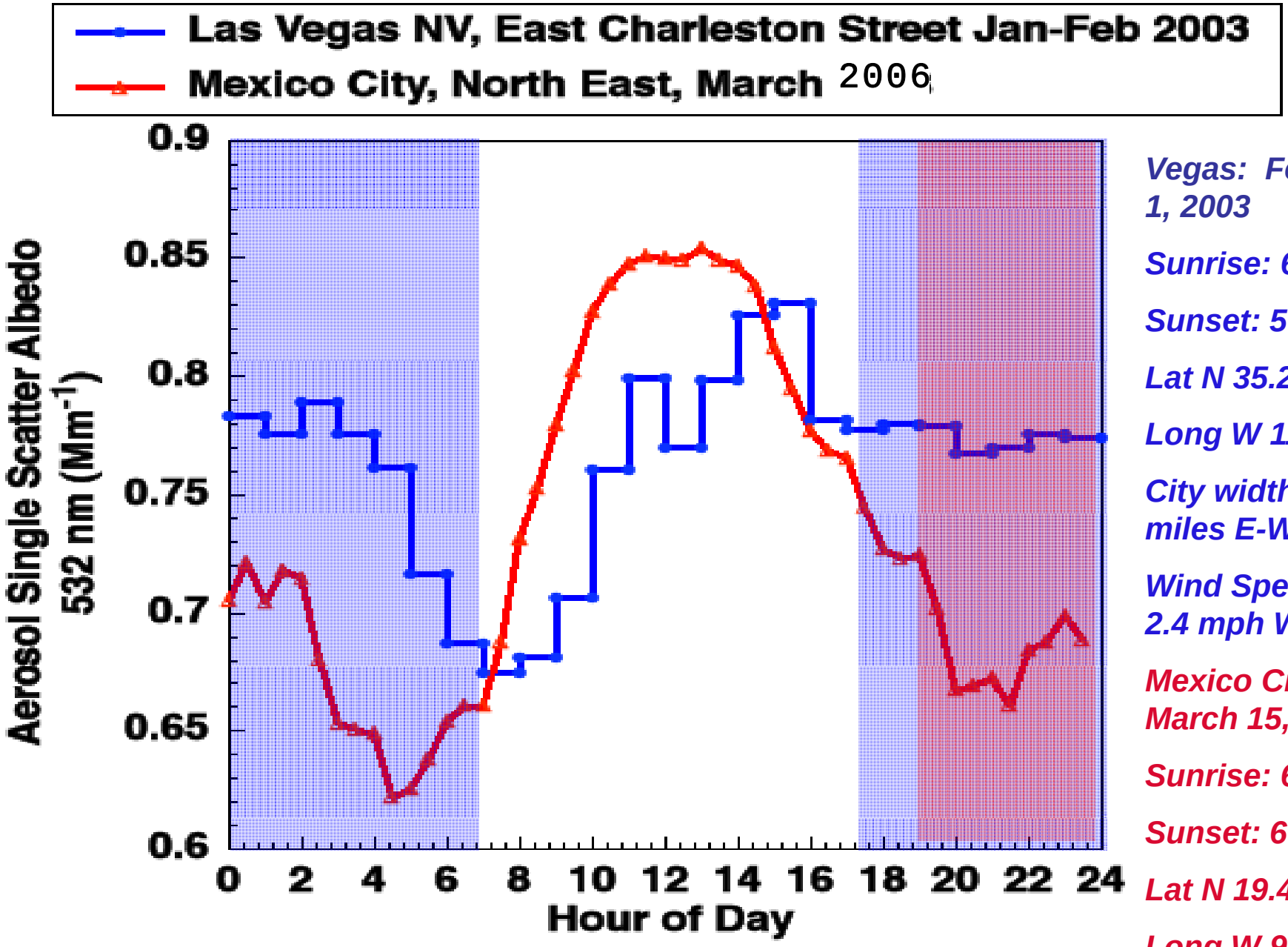
***Sunrise: 6:45 am***

***Sunset: 6:45 pm***

***Lat N 19.49***

***Long W 99.15***

# Single Scatter Albedo: Aerosol 'Brightness'

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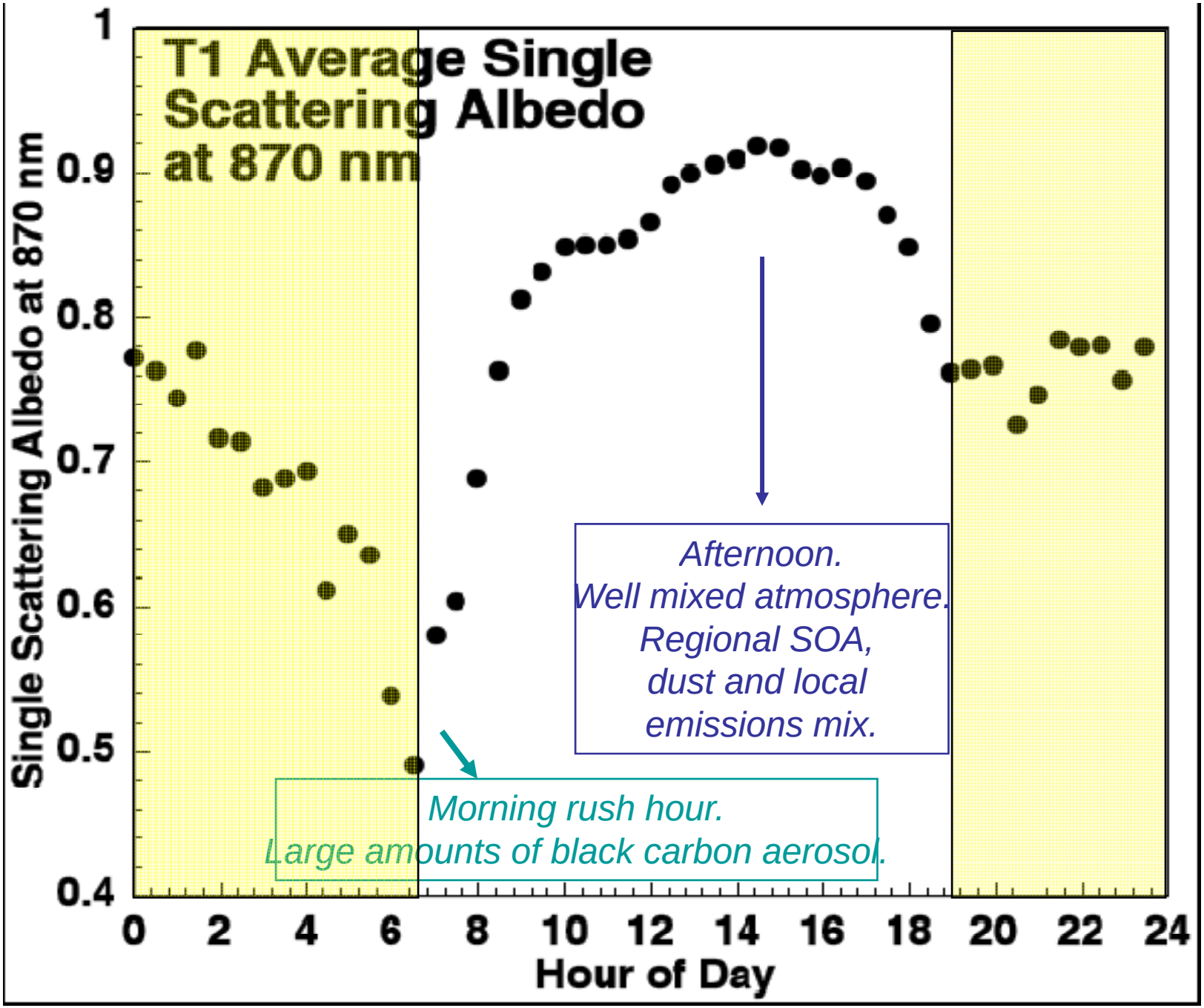
T1 Average Single Scattering Albedo at 870 nm
Single Scattering Albedo at 870 nm
1
0.9
0.8
0.7
0.6
0.5
0.4
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour of Day
Afternoon.
Well mixed atmosphere.
Regional SOA,
dust and local
emissions mix.
Morning rush hour.
Large amounts of black carbon aerosol.

# Observations that should be captured by models.

• More day to day variations of aerosol optics are observed in Mexico City than in Las Vegas Nevada USA (***meteorology***).

• Peak gaseous absorption is approx. 2 hrs later in the day than peak particle absorption (***photochemistry***).

• The diurnal variation in the single scattering albedo is more dramatic at T1 than at T0 indicating more aerosol composition and size variability (***source differences***)

• The single scattering albedo (**aerosol 'brightness'**) at the surface tends to follow the variation of sunlight during the day. (**Socio-physical-chemical observation**).

# Acknowledgements

*DOE ASP and NSF support*, the Milagro project organizers, and the assistance of Manvendra Dubey and Claudio Mazzoleni of Los Alamos National Lab with the instrument at the T0 site.

***Thank you for your attention…***